MONTANA BUREAU OF MINES A
GROUND WATER ASSESSMENT

EXHIBIT 13
DATE 1/19/2011
HB

Program History

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- "ground water supplies are threatened..."
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- "there is a need for better coordination among those numerous units of state, federal, and local government..."

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- Construction information for almost 229,792 wells
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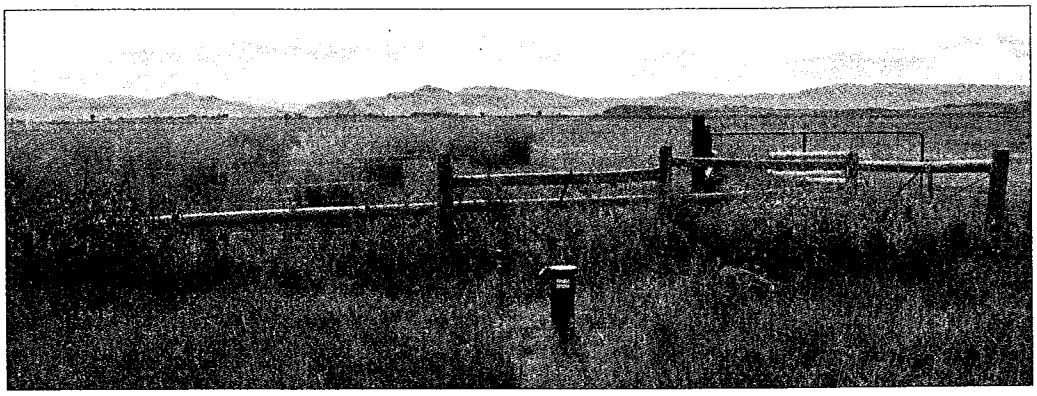
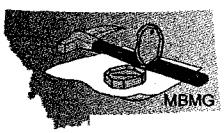
Who are GWIC customers, what do they do with data, and how can they get data?

More than 16,700 registered GWIC customers include people from all parts of Montana and about 2,570 individuals from other states. Out-of-state users are either private citizens who are considering purchasing land in Montana or consultants who have jobs in Montana. When entering the GWIC website, users are asked about whom they are and what they plan to do with GWIC data. The table at the bottom of page 2 shows who database users are and that they consistently return for more information as their needs and projects change.



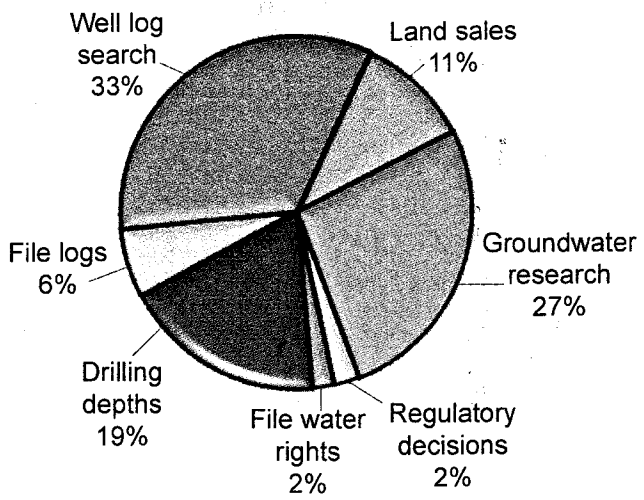
Monitoring wells 133382 and 145392, Beaverhead Valley, Montana



December 2010

GROUND WATER INFORMATION CENTER (GWIC)

The pie-chart (right) shows how people use GWIC data. About 20 percent of requests are from those who need to determine drilling depths. The need for a new well could be related to ranching operations, but is most often related to residential development. Another 17 percent of GWIC data are requested to support land sales and filing water rights. About one-third of data users simply say they are looking for a well log. The groundwater research category covers many other uses including data-gathering for environmental assessments.

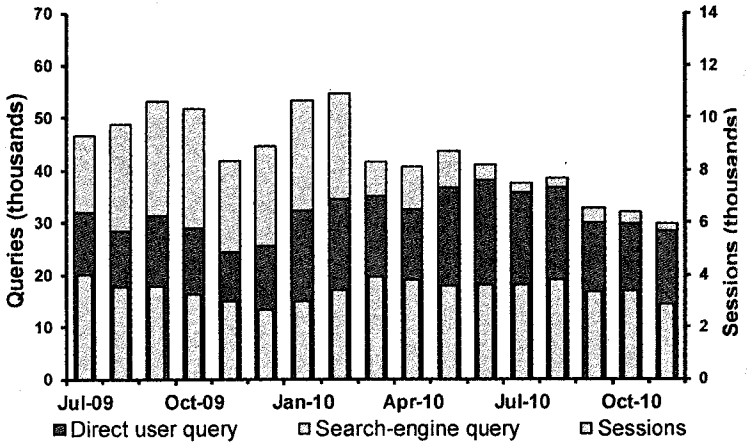


GWIC data are put to a variety of uses by a diverse customer group.

Usage of the GWIC website is stable (graph at right) and since July 1, 2009 has averaged about 43,100 queries/month; the average includes about 31,800 direct user queries and about 11,300 search-engine (Google, MSN, Yahoo, and others) queries. Although the previous July 2008–November 2009 monthly average was about 49,200, the number of direct user queries at that time was about 31,500 and search-engine queries were about 17,700. On the graph, MBMG efforts to control search-engine activity on GWIC websites becomes apparent in February/March 2010, when search-engine activity drops markedly. When more than one search engine would attempt to index the GWIC websites concurrently, their activity disrupted service to direct customers.

In 2005 GWIC staff began scanning well-log documents so that the images could be delivered via the website. Currently there are more than 205,000 images available. The original images fully capture the document's information.

On July 1, 2003 drillers began filing water-well logs directly with the MBMG. Statute also allows the MBMG to accept electronically filed logs. Between July 1, 2009 and November 30, 2010, 2,300 water-well logs (44 percent of all logs) were filed electronically through GWIC's "DrillerWeb" tool.



GWIC usage (http://mbmggwic.mtech.edu) now averages about 3,250 sessions and 43,100 queries each month.

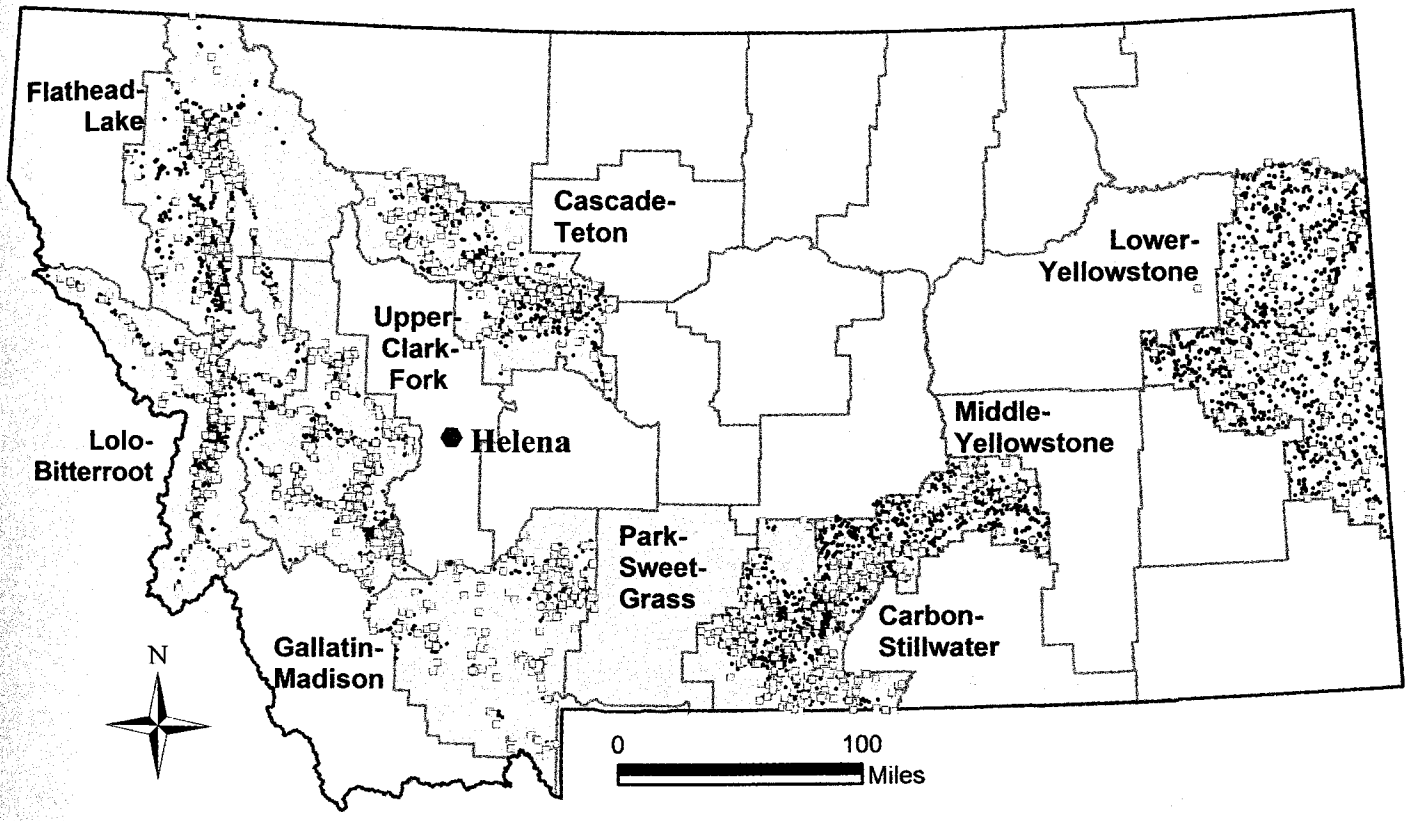
Customer groups	Customers	Logins	Return frequency
General public (agriculture, homeowners, landowners, students)	2,229	7,283	3.3
Water well drillers	145	5,804	40.0
Industrial/commercial (real estate agents, businesses)	2,189	17,014	7.8
Consultant/scientists (engineering and technical firms)	992	9,440	9.5
Government/scientists (regulators and scientists)	828	11,453	13.8
MBMG research	83	7,102	85.6

Between July 1, 2009 and November 30, 2010, GWIC customers logged in more than 58,000 times; averaging about 3,250 logins each month. The tabulation above does not include direct access to GWIC through the thematic mapper at the Natural Resources Information System (NRIS), "non-login" retrievals through the GWIC home page, or logins by GWIC staff to maintain the database.

The Characterization Program provides basic information about aquifers within specific areas as prioritized by the Ground Water Assessment Steering Committee. The locations for more than 8,950 site visits (dots) and 2,100 samples (yellow squares) generated by Characterization Program staff are shown on the map below.

Field work has been completed in the Cascade–Teton characterization area and is ongoing in the Gallatin–Madison area. The Steering Committee has selected the Park–Sweet Grass characterization area for future work. Characterization Program staff have described the hydrogeology of the 22 counties currently covered by active/completed groundwater characterization studies with two atlases, 42 maps, and 10 open-file reports. Between July 1, 2009 and November 30, 2010, customers purchased 53 hard copy maps and reports. During the same period, the GWIC/MBMG websites delivered 17,569 copies of Characterization Program maps and reports.

After work in the Gallatin–Madison area is completed in late 2011, program staff will begin attending meetings in in the Park–Sweet Grass Area and creating a 'monthly' monitoring network. In 2011 the Steering Committee will select the next characterization area(s).



The locations for more than 8,950 visited wells (dots) and 2,100 samples (yellow squares) collected by Characterization Program staff are shown above.

The MBMG has released 42 maps describing the hydrogeology of active characterization areas. Characterization Program staff also have visited more than 8,950 wells, and high-quality data from those wells are retrievable from the GWIC database at http://mbmggwic.mtech.edu.

- Montana Ground Water Assessment Atlases 1, 2, and 4. Thirty-one maps detailing the hydrogeology of the Lower Yellowstone River Flathead Lake, and Lolo-Bitterroot areas.
- Montana Ground Water Assessment Atlas 3. Seven maps detailing the hydrogeology of the Middle Yellowstone River Area.
- Well-visit data for 2,816 sites and results from 932 new water-quality analyses for the Upper Clark Fork River, Carbon-Stillwater, and Cascade-Teton study areas. Three maps released.
- Well-visit data for 680 sites and results from 253 new water-quality analyses for the Gallatin-Madison study area. Field work will continue until fall 2011.

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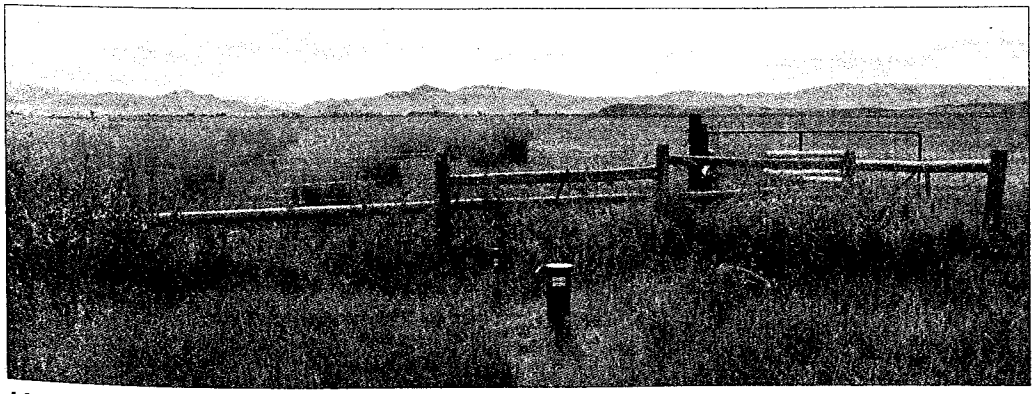

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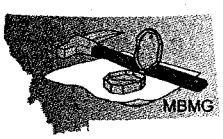
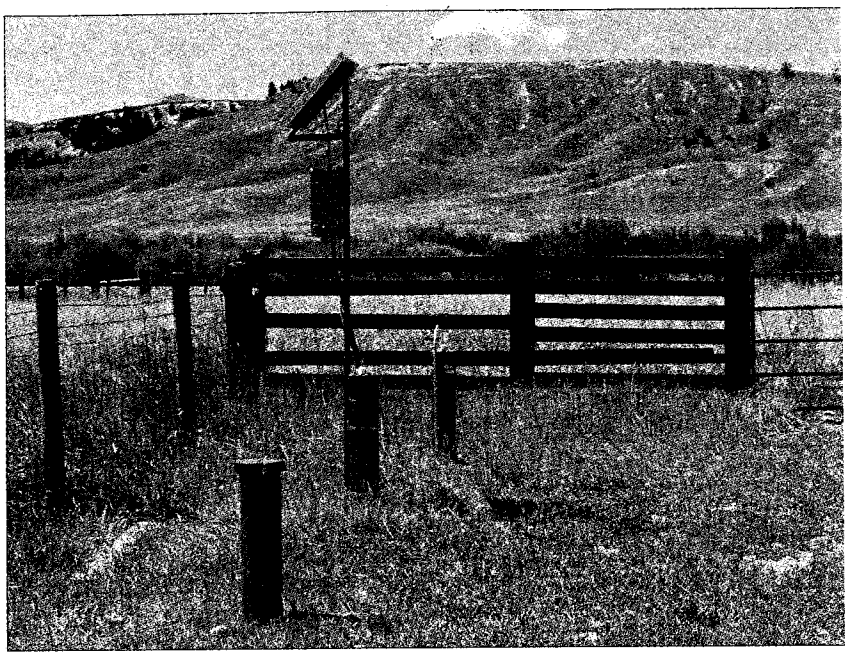


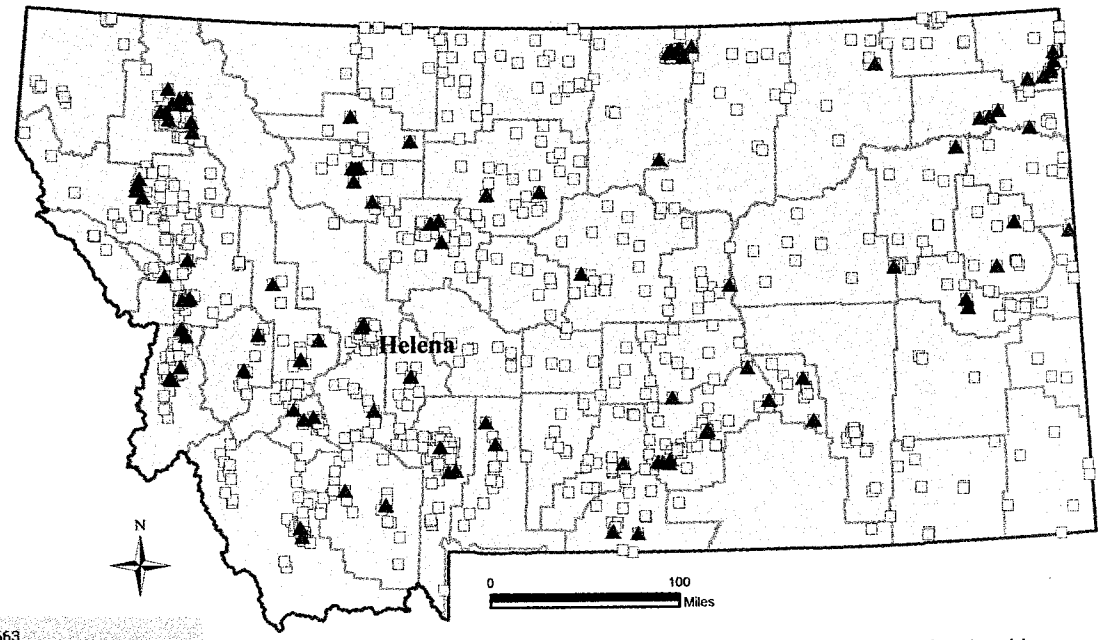
December 2010

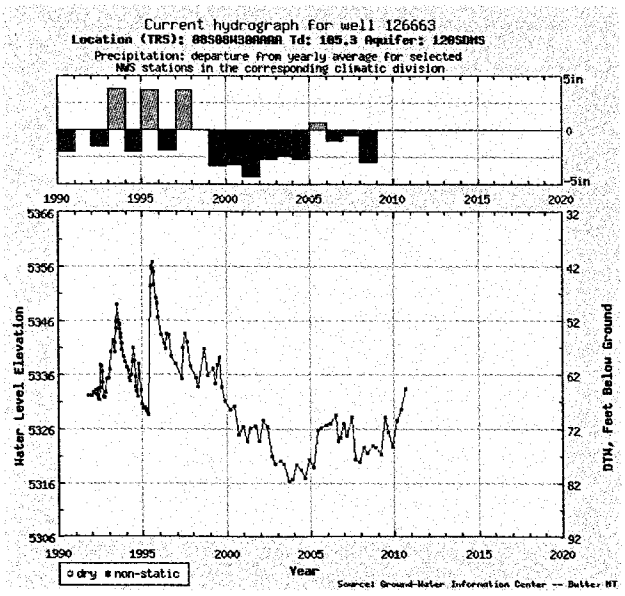
GROUND WATER MONITORING

The Ground Water Monitoring Program measures water levels each calendar quarter in 954 strategically located wells as shown by the yellow squares on the map (below right). Red triangles mark locations of continuous water-level recorders. Long-term groundwater-level records (see hydrograph below) are the only direct measure of how aquifers respond to seasonal, climatic, development, irrigation, or other land-use factors. Long-term groundwater hydrographs are similar to long-term records of stream flow and precipitation, and must be evaluated at decadal scales. For example, long-term water-level records help us to better understand the impact of drought on wells. In 2002, almost 85 percent of climate-sensitive wells were below their seasonal averages; in June 2010 Montana's drought had moderated and only about 60 percent of the wells were below their seasonal averages. Ground Water Monitoring also collects water-quality samples toward creation of long-term baseline water-quality records; the program collected 177 water samples during the biennium.

In an effort to improve efficiency and provide timelier water-level data from critical locations, the Ground Water Monitoring Program has installed three telemetry units to gather and send data directly to the Ground Water Information Center database. A photograph of the Deer Lodge Valley telemetry site is at top right.







Quarterly water-level data from about 954 wells help us understand how the groundwater resource responds to climatic and other factors. Additionally, 100 water-level recorders (triangles) provide continuous or hourly data. Water-level data are available from the Ground Water Information Center database.

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